Analysis of the Economics of Alternative Proposals to Permit the Use of Ultrafiltered Milk in Manufacture of Standardized Cheese and Related Cheese Products in the United States

Prepared as a part of comments on a proposed rule by the U.S. Food and Drug Administration

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On October 19, 2005 the United States Food and Drug Administration published a proposed rule "Cheeses and Related Cheese Products; Proposals to Permit the Use of Ultrafiltered Milk." (FDA)[1] The preamble to that rule included a cost benefit analysis of various alternatives considered by FDA in formulating its proposal

The analysis contained in this brief report was conducted as part of a comment on this proposed rule prepared by Blank Rome, LLP on behalf of Fonterra (USA), Inc. Its purpose is to review and comment on that cost benefit analysis. We focus primarily on the economics of permitting the use of fluid ultrafiltered milk (fluid UF) compared to permitting the use of both fluid ultrafiltered and dry ultrafiltered milk in the manufacture of standardized cheeses.

We start by outlining very briefly some basic principles of the economic analysis of regulatory change and then apply those principles to the case at hand. We then comment both generally and specifically about the published cost benefit analysis that appears in section III of the FDA Federal Register notice.

Guiding Conceptual Principles of Cost Benefit Analysis of Regulations

When a regulation changes we expect that firms, consumers and other economic actors will respond in an attempt to maximize their expected net benefits (which may be negative for some actors) given their cost characteristics, constraints and the market conditions which they face. If a regulator relaxes a constraint that limits behavior (such as relaxing the conditions under which UF milk may be used in the manufacture of standardized cheese)

[1] See the list of references cited at the end of this report.

firms adjust practices to the extent that they expect to profit from their adjustment. So, if a constraint is relaxed, but no profitable adjustment is available, then firms will make no adjustments. Simply put, relaxing a potential constraint on behavior is expected to make the potentially constrained firms at least as well off as they were before the rule change.

The FDA's cost benefit calculations of its proposal to remove the restriction against certain uses of UF milk in cheese manufacture does not seem to incorporate this principle. That is, removing a restriction does not require that the formerly prohibited practice be used even if unprofitable, and consequently that if use of UF milk were expected to be unprofitable firms would not adopt the new practices even if the rule restricting the practice were removed. Therefore, the effect of removing a constraint must improve the net benefits for firms previously constrained.[2] Furthermore, quantifying the aggregate expected effects of removing a restriction requires projecting the degree to which newly permitted practices are likely to be adopted.

Perhaps more important, by lowering costs of production for firms that change their practices, removing a restriction transmits economic effects both upstream from the firms making the initial adjustment (towards the market for raw milk supplied by farmers) and downstream towards the buyers of the product (towards consumers of cheese). These economic linkages are the function of markets and may be analyzed by considering shifts in the marginal cost or supply functions and by tracing through demand and supply responses to implied market price changes. We discuss these considerations below quantitatively in the context of the cheese market and the expected reduction in the cost of cheese production.

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[2] Of course, some firms may adopt a practice in error and invest in a technology that turns out to be less profitable than otherwise. But, there is no reason to expect systematic error or to expect that analysts outside the industry would be more likely to do the calculations more accurately, especially given the importance of data and other information that would be internal to the firms involved. Furthermore, if there were a very small number of firms producing and marketing the product, a constraint that raised costs and thereby reduced production could benefit the industry by enhancing market power or facilitating cartel pricing. This situation is not applicable to the cheese industry which includes several hundred firms.

The FDA cost benefit analysis in section "III. Executive Order 12866: Cost Benefit Analysis"

The FDA benefit analysis of Option 1, allowing the use of fluid UF milk in standardized cheeses, develops a cost accounting matrix that attempts to calculate cost savings in cheese manufacturing from cheese yield increases, lower transport and storage costs and lower costs for coagulant usage. FDA assumes that to achieve these cost improvements would require investment in facilities to increase the manufacture of fluid UF milk. FDA notes that all of its estimates that go into the calculations are uncertain due to lack of detailed data on costs and uncertainty about the rate of investment in fluid UF milk technology. FDA also makes conservative assumptions about the extent to which UF milk would be used to replace fluid raw milk in cheese manufacturing. While the FDA must base its calculations on many assumptions, more importantly it must consider the market adjustments that would follow from a reduction in the cost of production of cheese, which it fails to do. As noted above, these market linkages are crucial to understanding the economic costs and benefits and how they are distributed.

Competition in the cheese industry means that a lower cost of manufacturing cheese implies lower prices of cheese to downstream buyers, including food service firms, retailers and consumers. That lower price to buyers, in turn implies a larger quantity of cheese demanded. Milk producers also gain from lower manufacturing costs as the derived demand for milk ingredients rises when the cost of manufacturing falls. To meet the higher quantity of cheese demanded, more milk ingredients are required by the cheese industry. This in turn raises the price of milk ingredients and raises the price of raw milk.

FDA's cost benefit analysis neglects these important upstream and downstream linkages. Thus, the FDA analysis has not considered the appropriate set of economic relationships between cheese manufacturing, the market for cheese, and the market for cheese ingredients and raw milk supply. Responses to reduced restrictions on cheese production that affects costs of production will influence equilibrium prices and quantities. Here we use a standard model of market equilibrium to calculate the changes in equilibrium price and quantity in the cheese market caused by allowing fluid UF milk in cheese production.

According to the FDA cost benefit analysis, the increase in cheese yield from allowing fluid UF milk in standard of identity cheese can lower costs of production by up to two cents per pound or greater (F.R. p.60760). Let us use the average market price of 40-lb block cheddar traded on the CME since 2001, $1.42/lb (AMS), as the baseline marginal cost of production. Therefore, a two-cent reduction in costs would be equivalent to a 1.4 percent reduction in marginal costs.

FDA notes that net cost reductions are larger under Option 2, which allows dry UF milk also to be used in cheese. As the FDA notes near the top of page 60764, because of the higher protein content of dry UF milk, allowing its use would increase cheese yields by substantially more than would permitting the use of fluid UF milk alone. The gains are roughly in proportion to the remaining liquid in fluid UF milk. In the same paragraph, the FDA also notes lower expected rennet and starter use with dry UF milk. Obviously transport and storage cost savings also apply to using dry UF milk rather than fluid UF milk. Removing almost all of the remaining 1/3 of the water would reduce transport costs. Based on the FDA expectation of savings of $9 million to $24 million for option 1, the costs savings for Option 2, allowing dry UF milk as well is about 1/3 larger or between $12 and $32 million. A major benefit of dry UF milk relative to fluid UF milk is in storage costs and potential spoilage. These additional savings are consistent with the FDA discussion on page 60764, where they state, "It is safe to assume that total yearly savings from using dry UF milk would exceed $172 million." Oddly, these statements are not reflected in the summary table on page 60766. This is the most puzzling inconsistency in the FDA cost benefit analysis.

Permitting use of dry UF milk would lower costs substantially more than in the fluid UF case. We use a four-cent reduction in costs for this case. This implies a 2.8-percent reduction in marginal costs for the case of dry UF milk use in cheese.

The percentage change in the equilibrium price and quantity of cheese due to allowing fluid UF milk in standard of identity cheese, holding all else equal, can be calculated as:

Percentage change in equilibrium price of cheese = $\varepsilon\theta/(\varepsilon-\eta)$

Percentage change in equilibrium quantity of cheese = $\eta\varepsilon\theta/(\varepsilon-\eta)$

where θ is the percentage reduction in marginal costs due to allowing fluid UF milk in cheese production, ε is the elasticity of supply of cheese in the United States, and η is elasticity of demand for cheese in the United States. (For more on the derivation and application of this widely used model see Alston et al. among other standard references. Sumner and Balagtas and Balagtas, Hutchinson, Krochta and Sumner use a similar approach in more complicated models applied to dairy component issues.) To calculate the equilibrium changes in prices and quantities, we use an elastic supply of cheese ($\varepsilon = 4$) to represent a long-run horizon, and an inelastic demand for cheese (η=-0.5) (e.g., Heien and Wessels, Huang). Based on these parameter values, and setting θ = 1.4, based on the previous discussion of the percentage cost savings expected, allowing fluid UF milk in cheese production would result in a reduction of cheese prices by about 1.3 percent and an increase of cheese production and consumption at the wholesale level of about 0.6 percent increase. Next, to simulate the effects of permitting a dry UF milk as well, we set θ = 2.8 to reflect a 2.8 percent decline in costs of production. In this case, wholesale cheese prices fall by 2.5 percent, and cheese consumption and production increase by 1.25 percent at the wholesale level.

In the discussion of the costs of Option 1, the FDA notes (page 60762, last paragraph) that replacing fluid milk used for cheese by fluid UF milk would be neutral with respect to the total quantity of milk solids demand and hence not affect the quantity of raw milk used for cheese. FDA reasons that this means that government purchases of NFDM (or butter and cheese) would also be unaffected. This reasoning is sound as far as it goes. However, it leaves out two significant effects. First and most important, under this option the FDA shows that the cost of manufacturing cheese would fall (and FDA may underestimate the amount of this fall). As noted above, that means that the price of cheese facing commercial buyers would also fall and more cheese would be taken from the market at the lower price. More cheese means more milk solids used in cheese and the increased derived demand for milk solids in cheese means dairy farmers benefit from increased sales at a higher price. Furthermore, because total commercial use of dairy products would rise implying a rise in the price of milk components, there would follow a reduced probability of government purchases of NFDM.

A second effect relevant to government programs relates to the operation of the dairy price support program. The United States supports the price of farm-level raw milk at a legislated minimum price, currently $9.90 per hundredweight of milk. However, this support price is implemented by a program of purchasing manufactured dairy products, specifically cheese, butter and NFDM. The relationship between the support price for raw milk and the purchase price for each of the products is guided by the so-called make allowance, which reflects the costs of converting a unit of raw milk into a unit of the manufactured dairy product. The make allowance is set administratively and may be adjusted by USDA officials. A decline in the cost of production of cheese due to permitting the use of UF milk in the manufacture of standardized cheese may be an occasion for reducing the make allowance for cheese.

The FDA analysis presumes that all (or almost all) dry UF milk used in the United States would continue to be imported (page 60764). In fact, this does not follow especially if the demand by cheese manufacturers was substantial. Furthermore, current and recent period prices for milk protein in the United States have been at or below world prices and the United States has been a commercial exporter of NFDM. Under these conditions expansion of dry UF milk production in the United States is quite feasible.

Milk protein imports and milk protein prices

The literature on milk protein trade has found that the pattern of international trade in milk protein products is consistent with the basic economic concept that trade flows respond to relative prices (Bailey (2002), Bailey (2003), Jesse, and Alston, Balagtas, Brunke and Sumner). The government purchase program for NFDM in the United States, combined with tariff-rate quotas on some dairy product imports, have in the past resulted in U.S. prices of milk protein above world milk protein prices. High U.S. prices relative to world prices create incentives for U.S. buyers of milk protein to seek alternatives to domestically produced protein, and U.S. imports respond accordingly. When U.S. prices are low relative to world prices, imports wane.

Looking at data for milk protein imports and U.S. and world prices through 2002, Bailey (2002) and Bailey (2003) conclude that the pattern of MPC imports is directly related to (relative) U.S. prices of NFDM. These studies find that the growth in MPC imports during 1995-2000 coincided with a period of high U.S. prices of NFDM relative to world milk protein prices. MPC imports fell during 2001-2002 as U.S. prices of NFDM fell. Jesse also reasons that MPC imports are linked to the relative price of U.S. protein, with imports surging at a time of high U.S. prices of NFDM.

Under the dairy price support program, the U.S. government purchases NFDM when the U.S. price of NFDM falls to an administratively set government purchase price, currently \$.80 per hundredweight. During 1995-2000, when MPC imports were growing, NFDM milk prices were consistently at or near the government purchase price and the government accumulated NFDM stocks. At the same time, world prices for milk protein were relatively low. The U.S. price support program prevents prices of NFDM from falling significantly below the government purchase price for an extended period. This creates an incentive for U.S. users of milk protein to seek alternative products to NFDM, including imported milk protein.

The dairy price support program also influences the incentives of U.S. dairy manufacturers. By supporting the price of NFDM, U.S. manufacturers may produce more NFDM and less of other products. This is one reason that significant quantities of alternative milk protein products (casein, dry or fluid UF milk, MPC, etc.) have not been produced in the United States. (This point was also discussed by Bailey (2003) and Jesse).

Despite these realities of the dairy price support program, projections, made at the peak of MPC imports (1999-2001), that milk protein imports would disrupt U.S. dairy markets and increase government purchases of NFDM have not been realized. First, if imports had continued at their peak levels, their impact on the U.S. dairy industry would likely have been small. Sumner and Balagtas showed using a simulation model of U.S. dairy markets that milk protein imports would have practically imperceptible effects on the U.S all milk price that is received by farmers. The main reason behind this result is that even at their peak imports represented only a very small share in the total mix of available milk protein in the U.S. The share of milk protein imported as Chapter 4 MPC peaked at 1.4% in 2000. Hence even a large percentage change in the quantity of imported protein would have only small effects on total availability of protein in the United States, and thus a small effect on milk prices or government purchases of NFDM.

Moreover, since 2001. U.S. prices of NFDM have tended to be higher than the government dairy price support program purchase price, and the dairy price support program. The U.S. government has purchased very little NFDM under the price support program. Since November 2004, the government has not purchased any NFDM and has been reducing government stocks of stored NFDM (USDA Economic Research Service (b)). Not only has the market price in the United States been above the government purchase price, the world price of NFDM has been above the U.S. prices of NFDM, so that the U.S. has been a competitive exporter of NFDM. With U.S. prices for NFDM below world prices, milk protein imports have been relatively flat.

Both the USDA and the leading independent public agricultural projections organization forecast that high U.S. prices for NFDM are likely to continue. The USDA baseline projections are that the annual average U.S. all milk price will continue to rise through 2014-15, approaching $17/cwt (USDA Economic Research Service(c), p.60). Currently, government purchase prices for NFDM, cheese and butter are set in order to support a farm price of manufacturing milk of $9.90 (USDA Economic Research Service (a)). The USDA projections are that milk prices will remain well above the current support price. Dairy market projections from the Food and Agricultural Policy Research Institute (FAPRI) also show that NFDM milk prices will be above current support levels. The 2005 FAPRI projections are that the price of milk used for NFDM and butter will remain above $11/cwt through 2014, and prices of milk used for cheese will remain higher still, well above the current support price of $9.90/cwt. FAPRI projects that NFDM prices will remain at $.84/lb or higher through 2015, higher the current support price of $.80/cwt. for NFDM. Thus, these projections all indicate that the probability of government purchases of NDFM is relatively low in the coming years.

Moreover, the administrative management of the dairy price support program also increases the likelihood that government purchases of NFDM will be minimal. The USDA is authorized to adjust support prices for the various products to minimize government costs of the program (USDA Economic Research Service (a)). Current projections for cheese and butter prices are well above support levels for those commodities. If NFDM prices were to fall again towards support, the USDA could "tilt" its support prices (lower support prices for NFDM and raise support prices for cheese and butter) in such a way to reduce NFDM purchases.

Because of the projections for high U.S. prices for NFDM and the mandate that the USDA adjust support prices to minimize government purchases, it is unlikely that the government will purchase significant quantities of NFDM in the foreseeable future. Thus it is unlikely that an increase in dry UF milk imports, if it were to occur, would result in additional government outlays.

Demand for milk protein imports

Demand for dry UF milk products has been driven significantly by their technical advantages over NFDM. In cheese plants, filtered protein products with low levels of lactose offer an improvement over NFDM as way to add protein. Similarly, manufacturers of nutriceutical products (sports bars, diet products, etc.) have developed formulations that take advantage of the filtered milk protein products.

The technical superiority of some filtered milk protein products over NFDM means that these filtered milk protein products and NFDM are less than perfect substitutes. One implication of this is that demand for the filtered products exists even when prices of the filtered milk protein products are higher than the price of NFDM (on a comparable basis, such as $/lb of protein). For example, in recent months, cheese plants and other food manufacturers have continued to use filtered milk products despite high prices of filtered products relative to NFDM.

Relatively high prices of filtered milk products, and continued demand for these products despite high prices, have created incentives for U.S. dairy processors to produce the filtered products. Dairy Farmers of America, in a joint venture with Fonterra, has been producing MPC in Portales, NM since 2003, and other plants in development will increase domestic production of MPC and other tailored milk protein products. However, U.S. dairy processors have been slow to enter the tailored milk protein market in part due to the government program that supports the price of NFDM (as discussed above).

Those cheese plants and food manufacturers that choose to use the concentrated milk protein products benefit from their availability. Food manufacturers that are prevented from using the concentrated milk protein products, while others are allowed to use them, are put at a disadvantage. For example, the FDA prohibition on the use of UF milk protein in standard of identity cheese puts U.S. cheese plants at a disadvantage in world markets where Codex allows European manufacturers to make cheese with filtered milk protein.

Similarly, the FDA proposal to allow only fluid UF milk relative to allowing dry UF milk in cheese manufacture (Option 1) would also penalize smaller U.S. cheese manufacturers relative to larger manufacturers (p. 60760). Fluid UF milk is purchased by the truck load. Those cheese plants large enough to utilize a full truck load would benefit from FDA's proposal. However, smaller cheese plants would not benefit, and in fact would be placed at a competitive disadvantage. This bias against smaller cheese plants does not arise with dry filtered milk protein products, which can be purchased in volumes small enough for smaller cheese plants to benefit.

Summary and Conclusions

In this brief analysis we discuss serious concerns with the FDA cost benefit analysis comparing the effects of permitting fluid UF milk or dry UF milk to be used in the manufacture of standardized cheeses. First, the FDA cost benefit analysis neglects basic economic relationships that show that reducing costs of production of cheese manufacture will lower the price of cheese and raise the price of raw milk to farmers. Thus both consumers and farmers would gain from allowing UF milk in cheese manufacturing. Second, based on the FDA's own evidence and reasoning, the benefits of permitting dry UF milk to be used in cheese manufacturing would reduce the costs of cheese production substantially more than permitting fluid UF alone. Benefits of allowing dry UF milk would spread upstream to farmers and downstream to consumers. These gains are substantial and suggest a reduction in cheese prices and increases in cheese production and an increase in milk solids used for cheese. Third, our analysis indicates little or no risk of an increase in government costs of the price support system. Indeed, by raising the price of milk the potential cost of the government price support program would more likely fall. Finally, given projections of dairy non-fat-solids prices from both USDA and FAPRI, we expect little additional pressure for dairy imports. Further we find that adjusting standards for the manufacture of cheese based on protection from imports seems inconsistent with accepted principles and obligations under the World Trade Organization agreements.

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